

**QUARTERLY EXAMINATION 2023**

**TIRUVANNAMALAI DISTRICT**

**BIO-BOTANY - ANSWER KEY PREPARED BY**

**E.TAMILSELVAN MSc,M.Phil,BEd,MSc,M.A,MLIS,DIS,PGDCA**

**PG ASSISTANT BOTANY AIM MHSS -ARNI**

**TIRUVANNAMALAI DISTRICT**

**CLASS 12**

**MARKS 35**

**SECTION I**

**I. Answer all questions**

- 1.b.Winkler
- 2.d Alcaligenes
- 3.d.Agar
- 4.a.Medicago Sativa
- 5.b.Dr.M.S.Swaminathan
- 6.a.10 micrometer
- 7.b.1:2:1
- 8.d.Two copies of three different genomes

**SECTION-2**

**Answer any four Questions**

**9.What is Atavism**

**Atavism** is a modification of a biological structure whereby an ancestral trait reappears after having been lost through reemergence of sexual reproduction in the flowering plant *Hieracium pilosella* is the best example for Atavism in plants.

**10.What is Polyembryony.How it can commercially exploited?**

Occurrence of more than one embryo in a seed is called polyembryony

The first case of polyembryony was reported in certain oranges by Anton von Leeuwenhoek in the year 1719.

**Significance**

- The seedless fruits have great significance in horticulture.

- The seedless fruits have great commercial importance.
- Seedless fruits are useful for the preparation of jams, jellies, sauces, fruit drinks etc.
- High proportion of edible part is available in parthenocarpic fruits due to the absence of seeds.

### 11.What is the difference between missense and non sense mutation?

1.The mutation where the codon for one amino acid is changed into a codon for another amino acid is called **Missense or non-synonymous mutations**.

2.The mutations where codon for one amino acid is changed into a termination or stop codon is called **Nonsense mutation**

### 12.What is bio remediation?

It is defined as the use of microorganisms or plants to manage environmental pollution. It is an approach used to treat wastes including wastewater, industrial waste and solid waste.

### 13.Define cybrid?

The fusion product of protoplasts without nucleus of different cells is called a cybrid.

Cytoplasmic hybrid obtained by the fusion of cytoplasm of cells of different parental sources; a term applied to the fusion of cytoplasms of two different protoplasts;

### 14.What is ornithophily?

Pollination by birds is called Ornithophily. Some common plants that are pollinated by birds are *Erythrina, Bombax, Syzygium, Bignonia, Sterlitzia* etc., Humming birds, sun birds, and honey eaters are some of the birds which regularly visit flowers and bring about pollination.

## SECTION - 3

### 15.Compare the various types of blotting techniques.

Differences between Blotting Techniques

|               | <b>Southern blotting</b>      | <b>Northern blotting</b> | <b>Western blotting</b> |
|---------------|-------------------------------|--------------------------|-------------------------|
| Name          | Southern name of the inventor | Northern a misnomer      | Western a misnomer      |
| Separation of | DNA                           | RNA                      | Proteins                |
| Denaturation  | Needed                        | Not needed               | Needed                  |
| Membrane      | Nitrocellulose/ nylon         | Amino benzyloxymethyl    | Nitrocellulose          |
| Hybridisation | DNA-DNA                       | RNA-DNA                  | Protein-antibody        |
| Visualising   | Autoradiogram                 | Autoradiogram            | Dark room               |

## 16. Write the significance of ploidy

### Significance of Ploidy

- ✓ Many polyploids are more vigorous and more adaptable than diploids.
- ✓ Many ornamental plants are autotetraploids and have larger flowers and longer flowering duration than diploids.
- ✓ Autopolyploids usually have higher in fresh weight due to more water content.
- ✓ Aneuploids are useful to determine the phenotypic effects of loss or gain of different chromosomes.
- ✓ Many angiosperms are allopolyploids and they play a role in the evolution of plants

## 17. Differentiate the structure of Dicot and Monocot seed

- ✓ Dicot seed - *Cicer arietinum* endosperm contains reserve food and the Cotyledons are thin.
- ✓ The portion of embryonal axis projecting beyond the cotyledons is called **radicle** or embryonic root.
- ✓ The other end of the axis called embryonic shoot is the **plumule**.
- ✓ Embryonal axis above the level of cotyledon is called **epicotyls**
- ✓ whereas the cylindrical region between the level of cotyledon is called **hypocotyls**

### *Oryza* seed (example for Monocot seed)

The seed of paddy is one seeded and is called **Caryopsis**.

Each seed remains enclosed by a brownish husk which consists of glumes arranged in two rows.

- ✓ The seed coat is a brownish, membranous layer closely adhered to the grain. Endosperm forms the bulk of the grain and is the storage tissue. It is separated from embryo by a definite layer called **epithelium**.
- ✓ The embryo is small and consists of one shield-shaped cotyledon known as **scutellum** present towards lateral side of embryonal axis.
- ✓ A short axis with plumule and radicle protected by the **root cap** is present.
- ✓ The plumule is surrounded by a protective sheath called **coleoptile**.
- ✓ The radicle including root cap is also covered by a protective sheath called **coleorhiza**.
- ✓ The scutellum supplies the growing embryo with food material absorbed from the endosperm with the help of the epithelium

### 18. What are the reasons for Mendel's successes in his breeding experiment?

#### Mendel was successful because:

- ✓ He applied mathematics and statistical methods to biology and laws of probability to his breeding experiments.
- ✓ He followed scientific methods and kept accurate and detailed records that include quantitative data of the outcome of his crosses.
- ✓ His experiments were carefully planned and he used large samples.
- ✓ The pairs of contrasting characters which were controlled by factor (genes) were
- ✓ present on separate chromosomes.
- ✓ The parents selected by Mendel were pure breed lines and the purity was tested by self crossing the progeny for many generations.

### 19. Give an account on cryopreservation.

- ✓ Cryopreservation, also known as Cryoconservation, is a process by which protoplasts, cells, tissues, organelles, organs, extracellular matrix, enzymes or any other biological materials are subjected to preservation by cooling to very low temperature of  $-196^{\circ}\text{C}$  using liquid nitrogen.
- ✓ At this extreme low temperature any enzymatic or chemical activity of the biological material will be totally stopped and this leads to preservation of material in dormant status.
- ✓ Later these materials can be activated by bringing to room temperature slowly for any experimental work.

## SECTION 4

### 20.a. Why Mendel's pea plants are tall and dwarf? Find out the molecular explanation?

Molecular characterization of Mendel's gene for plant height.

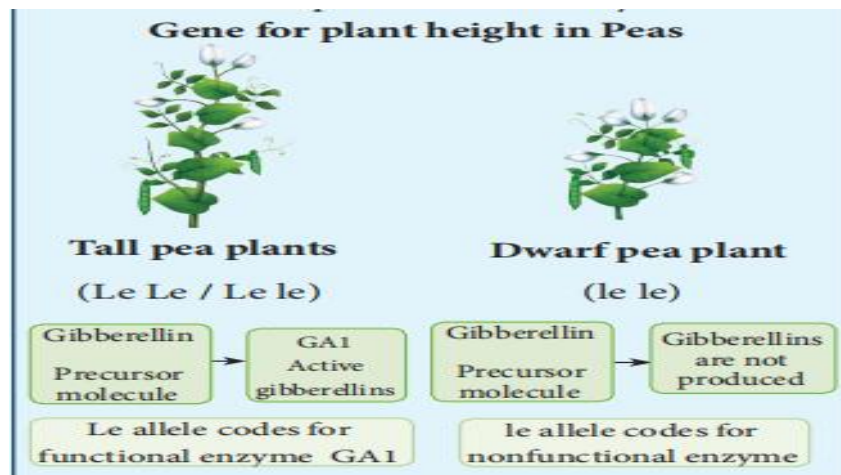
The plant height is controlled by a single gene with two alleles.

The reason for this difference in plant height is due to the following facts:

- (i) the cells of the pea plant have the ability to convert a precursor molecule of gibberellins into an active form ( $GA1$ )
- (ii) Tall pea plants have one allele ( $Le$ ) that codes for a protein (functional enzyme) which functions normally in the gibberellin-synthesis pathway and catalyzes the formation of gibberellins ( $GA1$ ).

The allele is dominant even if it is two ( $Le Le$ ) or single ( $Le le$ ), it produces gibberellins and the pea plants are tall.

Dwarf pea plants have two recessive alleles ( $le le$ ) which code for non-functional protein, hence they are dwarf.



b. Mention the application of biotechnology.

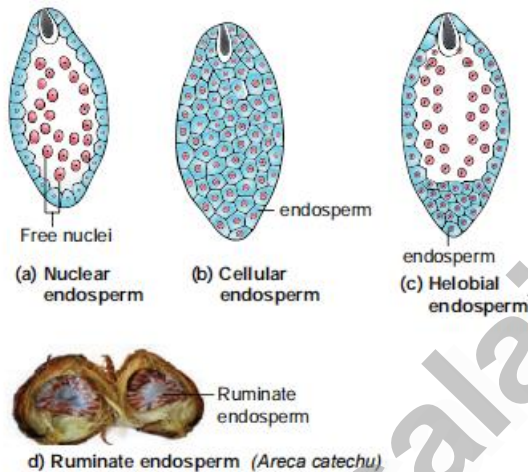
### Applications of Biotechnology

1. Biotechnology is one of the most important applied interdisciplinary sciences of the **21st century**. It is the trusted area that enables us to find the beneficial way of life.
2. Biotechnology has wide applications in various sectors like agriculture, medicine, environment and commercial industries.
3. This science has an invaluable outcome like **transgenic varieties** of plants e.g. transgenic cotton (Bt-cotton), rice, tomato, tobacco, cauliflower, potato and banana.
4. The development of transgenics as pesticide resistant, stress resistant and disease resistant varieties of agricultural crops is the immense outcome of biotechnology.
5. The synthesis of **human insulin** and blood protein in *E.coli* and utilized for insulin deficiency disorder in human is a breakthrough in biotech industries in medicine.
6. The synthesis of vaccines, enzymes, antibiotics, dairy products and beverages are the products of biotech industries.
7. **Biochip** based biological computer is one of the successes of biotechnology.
8. Genetic engineering involves genetic manipulation, tissue culture involves aseptic
9. cultivation of totipotent plant cell into plant clones under controlled atmospheric conditions.
10. **Single cell protein** from *Spirulina* is utilized in food industries.
11. Production of **secondary metabolites**, biofertilizers, biopesticides and enzymes.
12. Biomass energy, biofuel, Bioremediation, phytoremediation for environmental biotechnology.

### 21.a.What is endosperm.explain the types .

It is a nutritive tissue and regulatory structure that nourishes the developing embryo.

Depending upon the mode of development three types of endosperm are recognized in angiosperms. They are nuclear endosperm, cellular endosperm and helobial endosperm



**1.Nuclear endosperm:** Primary Endosperm Nucleus undergoes several mitotic divisions without cell wall formation thus a free nuclear condition exists in the endosperm. Examples: *Coccinia*, *Capsella* and *Arachis*

**2.Cellular endosperm:** Primary endosperm nucleus divides into 2 nuclei and it is immediately followed by wall formation. Subsequent divisions also follow cell wall formation. Examples: *Adoxa*, *Helianthus* and *Scoparia*

**3.Helobial endosperm:** Primary Endosperm Nucleus moves towards base of embryo sac and divides into two nuclei. Cell wall formation takes place leading to the formation of a large micropylar and small chalazal chamber. The nucleus of the micropylar chamber undergoes several free nuclear division whereas that of chalazal chamber may or may not divide. Examples : *Hydrilla* and *Vallisneria*.

The endosperms may either be completely consumed by the developing embryo or it may persist in the mature seeds. Those seeds without endosperms are called non-endospermous or ex- albuminous seeds. Examples: Pea, Groundnut cell and lower or basal cell. Further divisions in the zygote during the development lead to the formation of embryo. Embryo undergoes globular, heart shaped stages before reaching a mature stage. The mature embryo has a **radicle**, two **cotyledons** and a **plumule**.

b.Explain the basic concepts involved in plant plant tissue culture.

## Basic concepts of Tissue Culture

Basic concepts of plant tissue culture are totipotency, differentiation, dedifferentiation and redifferentiation.

### 1.Totipotency

The property of live plant cells that they have the genetic potential when cultured in nutrient medium to give rise to a complete individual plant.

### 2.Differentiation

The process of biochemical and structural changes by which cells become specialized in form and function.

### 3.Redifferentiation

The further differentiation of already differentiated cell into another type of cell. For example, when the component cells of callus have the ability to form a whole plant in a nutrient medium, the phenomenon is called redifferentiation.

### 4.Dedifferentiation

The phenomenon of the reversion of mature cells to the meristematic state leading to the formation of callus is called dedifferentiation. These two phenomena of redifferentiation and dedifferentiation are the inherent capacities of living plant cells or tissue. This is described as totipotency.

ALL VERY BEST

PREPARED BY

E.TAMILSELVAN MSc,M.Phil,BEd,MSc,M.A,MLIS,DIS,PGDCA

(BEST BIOLOGY TEACHER - AWARD WINNER FROM PADASALI)

DIRECTOR OF SRIJAYAM ONLINE ACADEMY -SANTHAVASAL

GET UR ONLINE BIOLOGY COACHING FOR 11<sup>TH</sup> &12<sup>TH</sup> CLASSES (ONLY EM)

REACH US : 9486398271 / 9865484736

KINDLY SUBSCRIBE & FOLLOW MY YOU TUBE CHANNELS: LEARN BIO MEDIA / ETS MEDIA

E-MAIL ID: srijayamtrust@gmail.com